**Mr. Alpert’s Advanced Physics  
  
Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

You are to watch four videos. The first leads into the second. The next two URL’s are listed at the head of each set of questions. Hand in your completed sheets.

**Video questions: Waves in strings (pipes) fixed (closed) at both ends.** <https://www.youtube.com/watch?v=-jP8TemO4jU> and the video that follows it

1. How do you recognize a “standing wave? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. How would you describe its movement? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is “damping”? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. How is a pipe closed at both ends similar in performance to waves in a string fixed at both ends? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Where is the air moving the most in a pipe?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Where is air not moving in a pipe with closed ends? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. How do you recognize the first harmonic in a pipe with closed ends? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. What is the generalized formula relating the velocity of a wave in a tube or string with closed ends to its wavelength? To its frequency? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Another generalization may be used to say that closed end pipes or strings beget \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and open ended pipes or strings beget \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Fill in the table proposed by Doc Schuster that relates the harmonic to the wavelength:

|  |  |  |  |
| --- | --- | --- | --- |
| Pipe closed at both end and a string fixed at both ends | | | |
| harmonic | Length of rope or pipe “L” in terms of the number of wavelengths |  | Wavelength in terms of overall length “L” |
| First |  |  |  |
| Second |  |  |  |
| Third |  |  |  |
| Fourth |  |  |  |
| fifth |  |  |  |

Waves on ropes and tubes with one open end

<https://www.youtube.com/watch?v=KZ7intMz2Y4>

Create and fill in a table similar to the one above but modifying it for a string fixed at one end and a pipe open only at one end.

|  |  |  |  |
| --- | --- | --- | --- |
| Pipe closed at one end and a string fixed at one end | | | |
| harmonic | Length of rope or pipe “L” in terms of the number of wavelengths |  | Wavelength in terms of overall length “L” |
| First |  |  |  |
| Second |  |  |  |
| Third |  |  |  |
| Fourth |  |  |  |
| fifth |  |  |  |

1. What is the generalized formula relating the velocity of a wave in a tube or string with one open end to its wavelength? To its frequency?

Video three

<https://www.youtube.com/watch?v=0FoA1bBM10M&ebc=ANyPxKoa8HlVuNEwxyyTRKFnSNnepBj6ot7cUjmNAlaHk7g9TzyuWULWNiIWbD9Hb5PoxMEEyDEcsncHNHVQiSEMBopUXDZ44Q>

Relationship of overtones and harmonics

1. What is the relationship between these two terms? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is the “fundamental” ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Why is this designation difficult for pipes which are open at one end? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What happened to the second overtone? Why can’t it exist? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_